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THE NASAL BONE AND SWORD OF THE SWORDFISH (*XIPHIAS GLADIUS*)

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The structure of the rostrum which has given its name to the members of that group of giant mackerels, the Xiphiiformes [the swordfishes, spearfishes and marlin-(spike) fishes], has been a persistent puzzle to anatomists since the days of Cuvier and Valenciennes.

Cuvier and Valenciennes (1831), Brühl (1847) and Regan (1909) have all called the dominant element of the sword the nasal bone. Gregory and Conrad (1937) in a study of the comparative osteology of the swordfish (*Xiphias*) and the sailfish (*Istiophorus*) while differing from previous authors in the homologies of the bones of the sword in the sailfish, agree with them in the case of *Xiphias*.

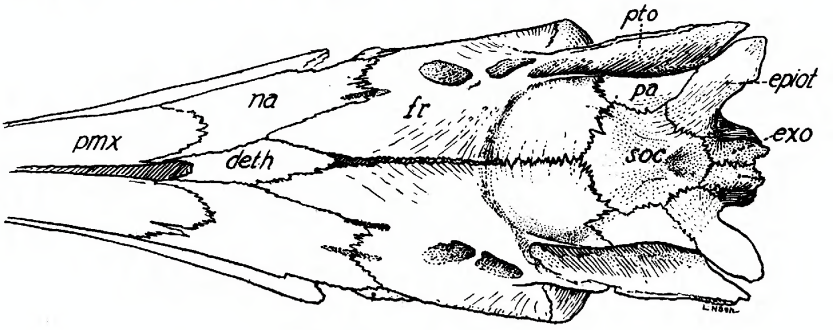

Fig. 1. Dorsal view of the skull of *Istiophorus*. After Gregory, 1933, figure 197B.

Regan figures a structural series of scombriform rostra starting with *Acanthocybium, Istiophorus, Xiphias* and culminating in the Eocene *Xiphiorhynchus*. This figure was copied by Eastman in 1914 in his 'Catalog of the Fossil Fishes in the Carnegie Museum. Part II.' In the case of *Istiophorus*, as implied by Gregory's figure (1933, Fig. 197B), Regan has omitted the very obvious nasal bone from his diagram. Thus in the case of *Istiophorus* the sword is made up exclusively of the

horizontal and ascending rami of the premaxilla, and the element that was originally called nasal is merely the ascending ramus of the premaxilla (Fig. 1).

Gregory and Conrad in considering the formation of the sword in *Xiphias* state (page 18):

> There are two possibilities: either the sword may be made up as in the sailfish or it may be made up of other elements and merely parallel that of *Istiophorus*. If the nasals in *Xiphias* have been pushed forward and outward laterally by the forwardly expanding frontals until they are now represented by a mere sliver situated above the narial cavity but covered dorsally by the overhanging frontals, then the elements of the sword may be homologized with those of *Istiophorus*.

However, because no such element was found they say in a final analysis:

> The bone that we identify as nasal retains part of its primitive association with the narial cavity for it enters the cavity anteriorly. There is also no evidence of any other nasal elements. If therefore we are to homologize the elements of the sword with those of the sailfish, we must acknowledge its identity as the nasal. Thus in the sailfish the enlarged nasals form the main part of the broad roof of the skull above the narial cavity and they serve to stiffen the base of the sword on the dorsal surface, whereas in *Xiphias* the narrow nasals have grown forward along with the premaxillae, meeting in the mid-line on the dorsal surface of the sword itself in front of and laterally to the elongate dermethmoid.

On November 5, 1937, only a month after the above statements had appeared in print, Mr. Edgar Greason, Jr., of New York City presented to the American Museum a small, juvenile *Xiphias* with a standard length of 1120 mm. and a weight (eviscerated) of $11^1/_2$ pounds. Dissection of the narial region of this young swordfish revealed a minute but well-formed bony element lying dorsad to the nasal openings (Fig. 2). There can be no doubt that this element is the true nasal bone, for its position is like that element in *Istiophorus* (Fig. 1). The fact that a tube passes through this bone for the accommodation of the supraorbital canal of the lateral line system seems to be further evidence of its identity as the nasal. Thus the sword of *Xiphias*, and probably *Xiphiorhynchus*, like that of *Istiophorus* consists only of premaxillae, of which the ascending and horizontal rami are severally homologous with those of other scombriforms such as *Acanthocybium* and *Thunnus*.

The rarity of small swordfish and the lack of anatomical notes on the ones known probably accounts for the improper naming of the elements by earlier authors, for it is apparently true that the adult *Xiphias* loses

the nasal, while at the same time the tip of the ascending ramus of the premaxilla encroaches on the nasal region and may easily be mistaken for the posterior end of a forwardly expanded nasal.

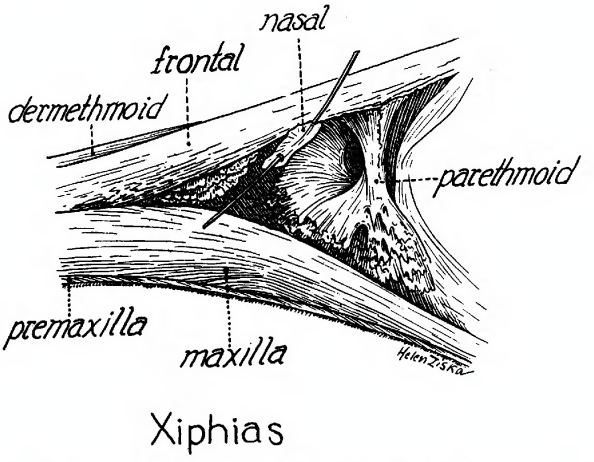

Fig. 2. Lateral view of the nasal region of a young *Xiphias*. A bristle has been passed through the supraorbital canal in the nasal bone.

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